Tech' Desk

Test-Flight, Power-on Stalls

In the last column, we covered the test-flight for power-off stalls. We are now going to expand the test-flight envelop of this aircraft, to ***power-on*** *stalls at maximum takeoff weight.*

Again I refer the reader to that excellent reference FAA AC90-89A. Not only does this AC cover this particular maneuver and test, but it also has a great deal of information on preparing for the flight tests, conditions and cautions to take, and in general how to prepare and carry out these tests progressively and safely.

The stalls will be 'wings level, straight ahead", and in this test we will load the aircraft to maximum take-off weight ensuring the C of G position is comfortably within the designer's recommended range.

Aircraft Weight and C of G position:

The spreadsheet below establishes the weight of the aircraft at 1750 (Designer's recommended maximum take-off weight for the RV-9A), with its C of G at 81.7". (The designer's C of G range for this aircraft is pegged at 77.95" to 84.84".)

Methodology:

C of G Calculation, Van's RV-9A, C-FBJJ, Oct. 27, 2007

Item	Weight (lbs.)	Datum (in.)	Moment (in. lbs.)
Empty Air-	1,145.0	78.4	89,768.0
Pilot & Pas-	370.0	92.7	34,299.0
Fuel	216.0	76.8	16,588.8
Baggage	19.0	122.0	2,318.0
Total	**1,750.0**	**81.7**	**142,973.8**

MTOW = 1750 lbs.

C of G Range = 77.95" to 84.84"

Since this test carries with it a degree of risk, the tests will be carried out at sufficient altitude to recover from a departure from controlled flight. We will use an initial altitude of 6000 feet AGL, which at High River, AB. is 9,500'. Also as we raise the nose of our aircraft in full power configuration, we can expect a substantial altitude gain before the aircraft stalls and falls off.

Our first stall test will be with flaps fully retracted, full power, wings level and straight ahead. We will watch for a pre-stall buffet, an audio and visual stall warning, and we will record the airspeed at the point of the stall and the altitude lost before recovery to level flight.

We will repeat this same process with flaps positioned in their 'take-off' angle of 20 degrees, and finally again with full-flaps applied.

Test Results:

October 27, 2007 dawned clear and cool, with beautiful smooth air for flight. OAT stood at 1 degree C. and the pressure altitude read 3300 ft. at our High River airport of 3431 ft. ASL.

Throughout these tests, the aircraft held no surprises and behaved in its normal benign manner. The test results are summarized below:

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Test-Flight, Power-on Stalls, continued

STALL TEST RESULTS

Condition	IAS	Pre-stall Buffet	Altitude Lost
	(KPH)		Before Recovery
Flaps-up	33 (estimated)	yes - pronounced	approx. 100 ft.
Take-off Flaps (20	25 (estimated)	yes - pronounced	approx. 160 ft.
Full flaps	0	yes - pronounced	approx. 200 ft.

The photograph right, taken just before the stall break on test No. 3, (power-on, full flaps) shows the airspeed at 0, and the angle-of-attack warning lights lit up like a Christmas tree! Notice the high horizontal miniature aircraft bar on the artificial horizon, and the full fuel-burn of 8.7 USGPM on the fuel-flow engine analyzer, (ie. showing full power applied on a 160 HP Lycoming 0320). Also notice that the aircraft has climbed to an altitude of 10,700 ft. ASL as the nose is raised and the airspeed has bled off.

There was a definite tendency for the aircraft to roll to the left in the stalls with flaps deployed, but easily controlled with application of right rudder. Again, this may be an indication of a slight asymmetrical flap extension, or more likely caused by the increased engine torque reaction and propeller slipstream effect.

Conclusion:

These tests show that this aircraft stays benign in its departure from controlled flight under maximum take-off weight and full power conditions throughout the range of flap deployment. Again, these tests were conducted with the C of G near the centre of the designer's recommended range. To explore these series of tests to the edge of the operational envelope, one final series of tests should be undertaken; that with maximum take-off weight, maximum aft C of G location, and full power through the full range of flap deployment.

'OOPS' AUTHOR'S ERROR AND CORRECTION:

In an earlier column, I covered the Flight Test for the Best Glide Speed. I am indebted to Don Sinclair for bringing the following error to my attention:

In my calculation to arrive at the 'Altitude lost/nautical mile', I used a conversion of 5280 ft. instead of the correct 6076 ft. per nautical mile. This skewed my graph and the corrected values obtained should have been '**520 ft. of altitude lost at a best glide speed of 80.5 KIAS'** as compared to the erroneous '444 ft at 79 KIAS'.

Should any reader wish to obtain a copy of my corrected work, please e-mail me at CGYRV@yahoo.com, and I will be pleased to provide the same.